MEMO

DATE: December 6, 2007

TO: Energy and Environment Committee

FROM: Jennifer Sarnecki, AICP, Senior Planner, (213) 236-1829, sarnecki@scag.ca.gov

SUBJECT: Pier 400 Project

BACKGROUND:
On September 25, 2007, David Wright, Vice President of Plains All-American, presented to the Energy Working Group. No concerns were expressed regarding the project but clarification questions were asked about the logistics of construction and operation.

As Mr. Wright stated to the Energy Working Group, the proposed project at the Port of Los Angeles will be designed to receive, store and transfer crude oil to local refineries and storage facilities. The proposed terminal could provide 25 percent of southern California's crude oil needs and complete a component of the Port's master plan. No finished products (e.g. gasoline, diesel fuel, etc.) or liquefied natural gas will be handled at the facility.

A representative from Plains All-American will provide information regarding the proposed deepwater crude receiving terminal for the Energy and Environment Committee's consideration.

Attachment:
PowerPoint presentation
California Energy Commission 2007 Integrated Energy Policy Report excerpt

FISCAL IMPACT:
Staff time related to coordinating this item would be funded by WBS# 08-020.SCGS1.

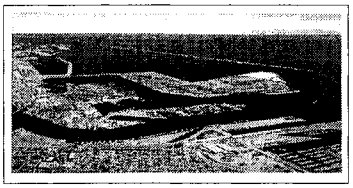
Reviewed by:
Division Manager

Reviewed by:
Department Director

Reviewed by:
Chief Financial Officer

Pacific L.A. Marine Terminal LLC

Pier 400 – Berth 408
Liquid Bulk Petroleum Terminal



Southern California Association of Governments

PLAINS ALL AMERICAN PIPELINE, L.P.

Pacific L.A. Marine Terminal LLC

Pier 400 – Berth 408 – Port of Los Angeles

- Project is the development of a new world scale deep water crude oil import terminal
- Facility will be developed in the Port of Los Angeles
- Project consists of a marine dock, shore side pumps, series of underground pipelines and 4 million barrels of marine receipt petroleum storage tankage
- Nearly all of the new facilities will be built on POLA property
- Facility will have initial capacity to accommodate over 25% of the Southern California regional crude oil demand

PLAINS ALL AMERICAN PIPELINE, L.P.

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Pacific L.A. Marine Terminal LLC

Plains – Pacific Merger

- Project was started by Pacific Energy Partners, L. P.
- Merger took place on November 15, 2006
- Plains All American Pipeline, L.P. (NYSE "PAA") acquired the general partner interest in Pacific Energy Partners ("PPX"), exchanged PAA units (limited partner interests) for PPX units at 0.77/1.0 ratio
- PPX merged into PAA
- The combined company has an estimated market value of over $6.0 billion
- PAA Operations include transportation, storage, terminalling and marketing of crude oil, refined products, liquefied petroleum gas and other natural gas-related petroleum products in the United States and Canada

PLAINS ALL AMERICAN PIPELINE, L.P.

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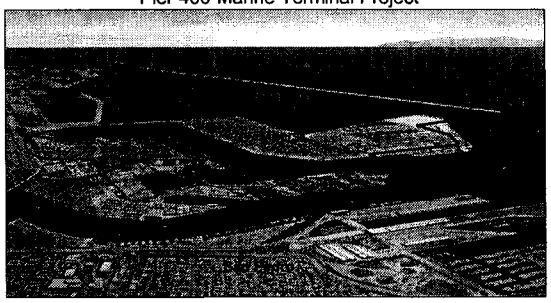
Pacific L.A. Marine Terminal LLC

Pier 400 Marine Terminal Project



PLAINS ALL AMERICAN PIPELINE, L.P.

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Pacific L.A. Marine Terminal LLC

Pier 400 Details

- The 81 feet of deep-water terminal at Pier 400 will accommodate the newest and largest tankers
- Designed to accommodate up to 325 MDWT vessels
- 4 million barrels of new petroleum storage
- System will accommodate a variety of types of oil through efficient marine receipt storage
- Estimated 250,000 barrels per day of startup throughput capacity that grows to meet demand over time
- High capacity pipeline connections to local refineries, other Plains' systems and other 3rd party tank farms and pipelines in the Port of Los Angeles area

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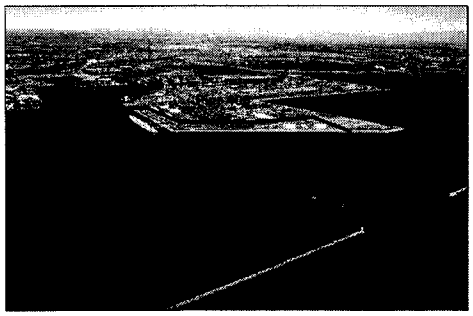
Pacific L.A. Marine Terminal LLC



PIPELINE, L.P.

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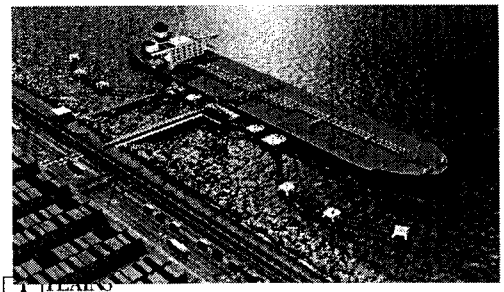
Pacific L.A. Marine Terminal LLC

Berth 408 View with VLCC



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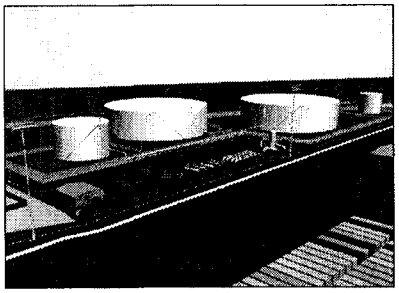
Pacific L.A. Marine Terminal LLC

Berth 408 – Site 1 – Tankage and Pumps



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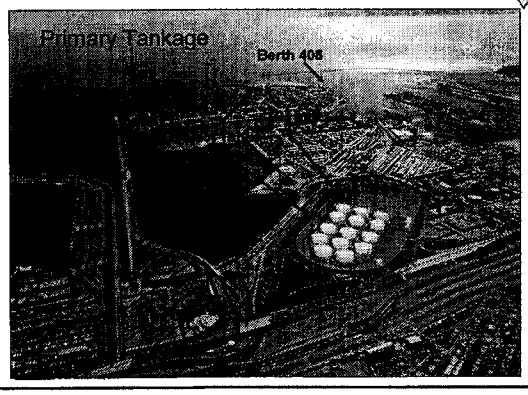
Pacific L.A. Marine Terminal LLC



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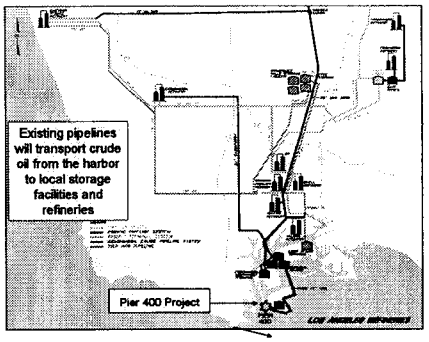
Pacific L.A. Marine Terminal LLC



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Pacific L.A. Marine Terminal LLC

Strategic Project

- Vital for the Southern California economy
- First new petroleum terminal in 30 years
- Deepest safe harbor in the U.S. – 81 feet of depth
- The project has the initial capacity to supply 25% of today's petroleum needs of Southern California
- Significant strategic value to California and the South West United States
- Local production is falling off faster than anticipated
- Representatives from California Energy Commission have expressed continued concern about California's import situation

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Pacific L.A. Marine Terminal LLC

Project Addresses Key Environmental Issues

Air Quality
- Will meet objectives of Ports' Clean Air Action Plan (CAAP)
- Residential health risk is less than 4 in one million PM
- Offsets 120% of operational air emissions (AQMD Requirement)
- Incorporates shoreside pumps
- Efficient operation minimizes time in port
- Will use AMPing or equivalent
  - Phase in over time
- Uses low sulfur fuels
  - Begins at 40 nautical miles
  - Main engine switching – protocol to be established
  - Auxiliary engines and boilers (main engines if required)
  - Phase in over time
- Reduces ship speed – 12 knots/hour from 40 nautical miles
- No trucking – No Trains
- Specific Details will be discussed in pending Draft EIR/EIS

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Pacific L.A. Marine Terminal LLC

Facing the Future

- Historical sources of crude oil from California and Alaska are running out
- Los Angeles basin is projected to need twice as much oil by 2015
- Even if conservation efforts are successful, and demand remains constant, we will still need to find replacement sources
- The current petroleum import infrastructure is near capacity
- We must have the critical new infrastructure to accept these imports
- Future oil supply will come from distant locations in large ships

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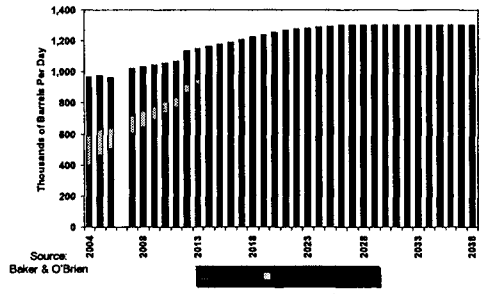
Pacific L.A. Marine Terminal LLC

Southern California Crude Oil Demand



Source: Baker & O'Brien

Base Case: Annual Capacity Creep
2006-2021: 1.25%; 2022-2026: 0.50%; 2027-2038: 0.00%.

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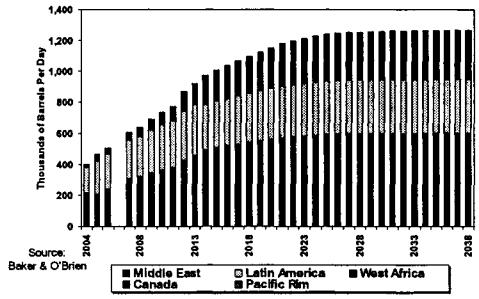
Pacific L.A. Marine Terminal LLC

Sources of Imports



Source: Baker & O'Brien

Base Case: Annual Capacity Creep
2006-2021: 1.25%; 2022-2026: 0.50%; 2027-2038: 0.00%.

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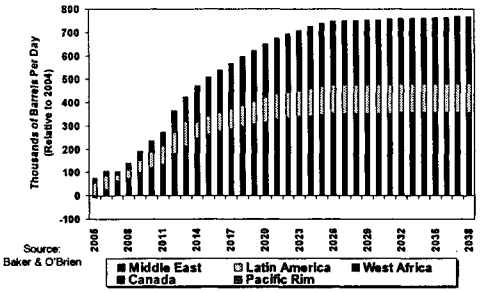
Pacific L.A. Marine Terminal LLC

Incremental Imports to Southern California



Base Case: Annual Capacity Creep
2006-2021: 1.25%; 2022-2026: 0.50%; 2027-2038: 0.00%.

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Pacific L.A. Marine Terminal LLC

Project Schedule

- Project Application to POLA – April 2003
- POLA/USACE – Notice of Project – June 2004
- Expect Draft EIR in November or December of 2007
- Four to five months for POLA Approval
- Four to five months with Mayor, City Hall and City Council
- Start Construction – August/September 2008
- Finish Construction – 2010

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Pacific L.A. Marine Terminal LLC

Implications for Local Economy

- $418 million project (includes POLA dock design/construction)
- Project Labor Agreement (PLA)
- Letter to POLA Commission regarding union operation
- Employment - at least –
  - 4,800 full year equivalent union construction jobs
    - Pipe Trades, Boilermakers, Electricians, Piledrivers, etc.
  - 172 full time direct and indirect permanent jobs
    - Tank farm operations, vessel tie ups, clerks, maintenance personnel
- Provides significant new tax base for City, County and State
- Continuation of high paying jobs at regional refineries

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Pacific L.A. Marine Terminal LLC

Commercial Update

- Current construction cost estimate:
  - $368+ million (Plains investment) Estimate up $50 million from last year
  - $ 50+ million (POLA – Plains All American Liability)
- Finalizing on another cost estimate (upward) revision
- Capacity fully subscribed
- Reviewing options for additional capacity

PLAINS ALL AMERICAN PIPELINE, L.P.

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Pacific L.A. Marine Terminal LLC

Plains All American Pipeline L.P.
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PLAINS ALL AMERICAN PIPELINE, L.P.

CALIFORNIA ENERGY COMMISSION

2007 Integrated Energy Policy Report

DRAFT COMMITTEE REPORT

October 2007
CEC-100-2007-008-CTD

Arnold Schwarzenegger, *Governor*

CALIFORNIA ENERGY COMMISSION

Integrated Energy Policy Report Committee

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Associate Member

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Susanne Garfield
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Principal Authors

DISCLAIMER

This report was prepared by the California Energy Commission's Integrated Energy Policy Report Committee as part of 2007 Integrated Energy Policy Report Proceeding - Docket # 06-IEP-1 and associated subdockets. The report will be considered for adoption by the full Energy Commission at its Business Meeting on November 21, 2007. The views and recommendations contained in this document are not official policy of the Energy Commission until the report is adopted.

2007 Integrated Energy Policy Report Proceeding

The *2007 Integrated Energy Policy Report* is a product of the 2007 Integrated Energy Report Proceeding, Docket Number 06-IEP-1, and its supporting record. Several staff provided significant contributions to the development of this Draft Committee Report.

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Preface

This *2007 Integrated Energy Policy Report* (*IEPR*) was prepared in response to Senate Bill 1389 (Bowen), Chapter 568, Statutes of 2002, which requires that the California Energy Commission prepare a biennial integrated energy policy report that contains an integrated assessment of major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety (Pub. Res. Code § 25301[a]). This report fulfills the requirement of SB 1389.

The report was developed under the direction of the Energy Commission's 2007 Integrated Energy Policy Report Committee (Committee). As in previous IEPR proceedings, the Committee recognizes that close coordination with federal, state, and local agencies is necessary to adequately identify and address critical energy infrastructure and related environmental challenges. In addition, input from state and local agencies is needed to develop the information and analyses that these agencies need to carry out their energy-related duties. This *2007 IEPR* reflects the input of stakeholders and federal, state, and local agencies that participated in the IEPR proceeding. The information gained from workshops and stakeholders was essential in developing the recommendations in this report. The Committee would like to thank stakeholders for their participation and thoughtful contributions to the process.

Table of Contents

CHAPTER 7: Meeting Transportation Needs

Californians have had a love affair with the automobile and the open road since the 1920s. Perhaps no other population in the world has embraced the automobile as passionately as Californians and probably no other state is defined as much by the car as California.

Cars give Californians the individual freedom and autonomy we crave. But, this freedom comes with a high price, both to the environment and consumer pocketbooks. Vehicles are the major contributor to global warming pollution. Almost 40 percent of carbon dioxide (CO_2) and other greenhouse gas emissions in California are caused from burning transportation fuels, mainly gasoline and diesel in cars and trucks. We must change our relationship with automobiles and the way we view transportation—at a personal as well as a state policy level.

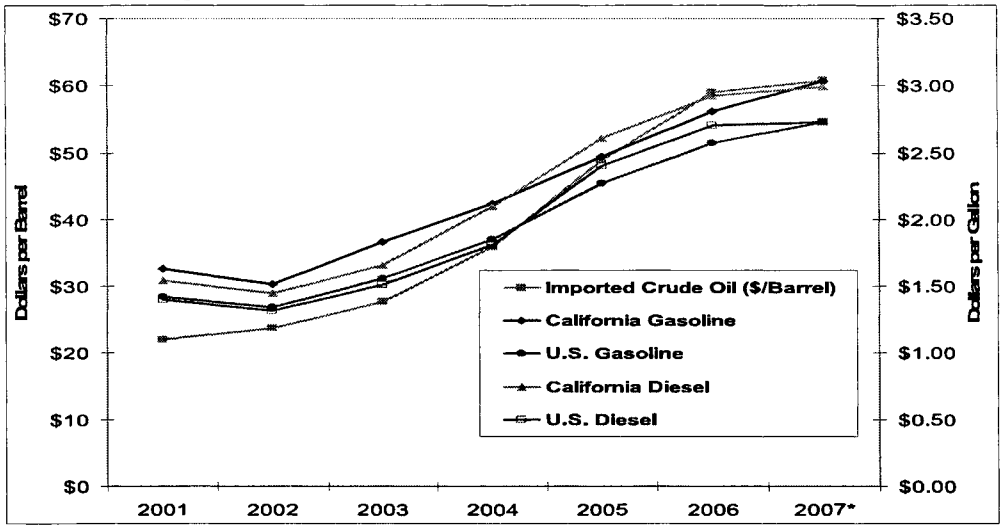
Transportation dominates California's overall energy consumption. Almost half of all energy used in the state moves people and goods – and nearly 100 percent of fuel demand is met by petroleum. The state's nearly 26 million registered vehicles consume about 380 million barrels of gasoline (over 16 billion gallons) and almost 100 million barrels of diesel (over 4 billion gallons) each year. California is the second largest consumer of gasoline in the world, behind the entire United States and just ahead of Japan.

Sustaining California's economic vitality in the short term depends on ample supplies of gasoline and diesel fuels at stable prices. California has neither.

California's gasoline prices, due to high oil prices as well as in-state refinery maintenance problems and breakdowns, reached a record high of $3.46 per gallon during May 2007 (Figure 7-1). In addition to reducing the real income of consumers forced to pay higher fuel prices, increases in crude oil prices drive up the average cost of production of goods and services throughout the economy. This negatively affects the state's economy and gross state product. Major petroleum price hikes; such as those experienced in 1973-74, 1979-80, and 1990; all led to national recessions.

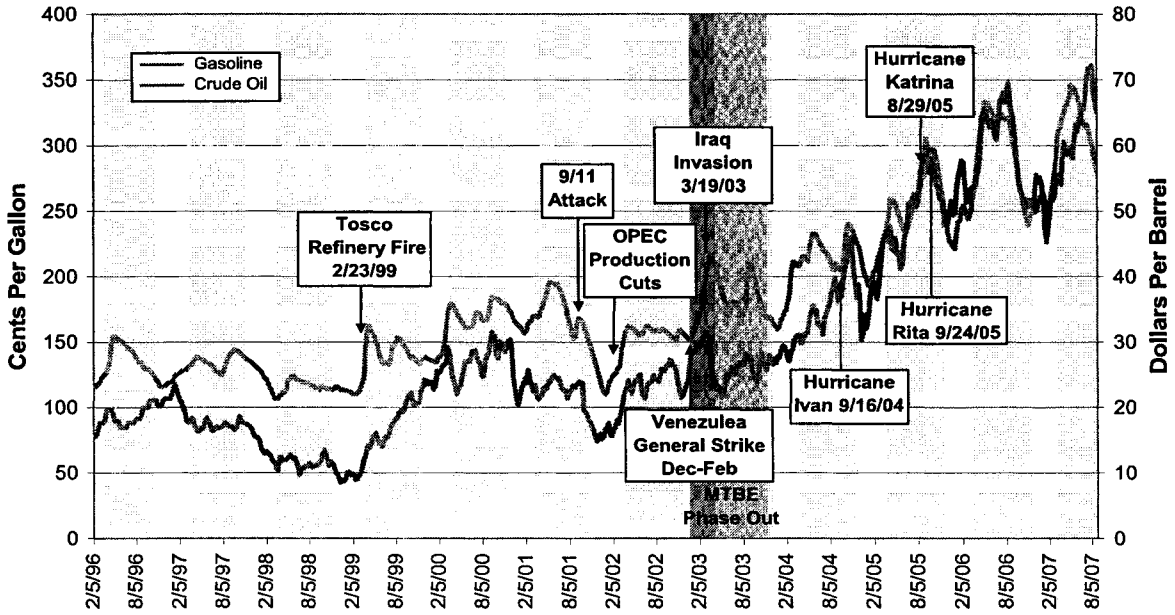
Crude oil is the single largest cost component in producing gasoline and diesel, accounting for between 42 and 56 percent of the price of regular gasoline in the last year. World oil prices have more than *doubled* since 2004. Skyrocketing demand in China and other developing nations, along with current world conflict, particularly in Nigeria and the Middle East, are exacerbating the situation. Other factors such as weather and geopolitical events also affect crude oil and gasoline prices (Figure 7-2).

Figure 7-1: Gasoline, Diesel and Crude Oil Prices



Source: California Energy Commission

Figure 7-2: California Gasoline and World Crude Oil Prices



Source: California Energy Commission

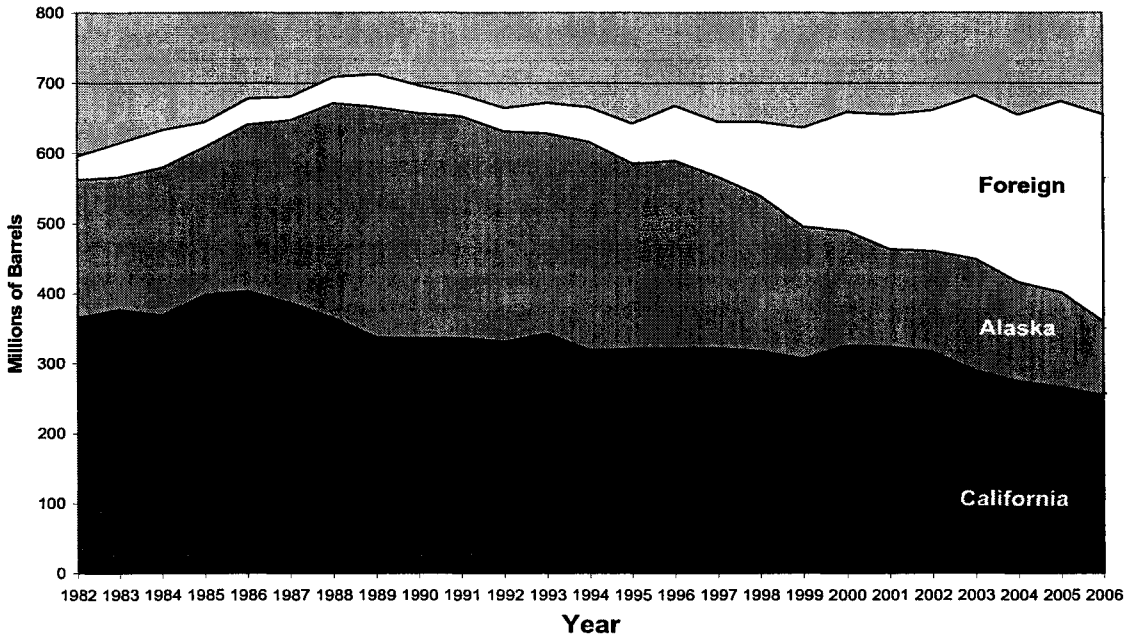
Notes: Shaded Regions represent periods of summer gasoline blends, produced from February through October in Southern California and from March through October in Northern California. California became a gasoline net importer sometime in the late 1990s. Oil prices triple between January 1999 and September 2000 due to strong oil demand and OPEC oil production cutbacks

By September 2007, crude oil prices had exceeded $80 per barrel. Crude oil, regardless of its origin, is pegged to world oil prices, and these price trends emphasize the importance of reducing our growing dependence on foreign oil sources.

Twenty-five years ago, California received 94 percent of its crude oil supplies from in-state production and Alaskan imports, with foreign sources contributing little (Figure 7-3). By 2006, the situation had reversed, with foreign imports making up 61 percent of the crude oil refiners use. Declining in-state production and limited refining capacity means that California has to import ten percent of its refined blending components and finished gasoline and diesel to meet growing demand.

Adding further challenges, California's petroleum infrastructure operates at near capacity and the volume of imports is constrained by limited storage capacity and marine terminal capabilities at Southern California ports.

Figure 7-3: California's Crude Oil Sources



Source: California Energy Commission

Breakdowns and outages at in-state refineries and pipeline facilities quickly tighten gasoline and diesel supplies, creating price spikes. California is not directly connected by pipeline to other domestic refining centers, and in-state refiners cannot readily procure gasoline, diesel, and other blending components when outages occur. Relying on imports of petroleum and

finished product coming into this constrained infrastructure environment creates a market conducive to extreme price volatility. This contributes to higher and more prolonged price spikes, as we have experienced over the last several years.

Transportation Fuel Demand Trends

In the past 20 years, California's population has increased at an annual average rate of 1.7 percent per year and personal income has increased at 1.58 percent per year. Over the 2005 to 2030 time period, projections forecast a slowing of growth for both population and income, to 1.04 percent and 1.08 percent per year, respectively.[280] Nevertheless, California's population is estimated to exceed 44 million by 2020. Even if not climbing at historic high rates, the total growth will be considerable and result in substantial increases in transportation fuel demand for the state.

Besides population growth, California's transportation fuel demand is affected by many other factors, including economic growth, fuel prices, and consumer behavior such as vehicle purchasing and driving habits. Energy Commission staff developed several demand forecasts with different levels of transportation fuel consumption and several variable factors such as fuel prices, technology developments, and greenhouse gas reduction regulations. For petroleum supply and imports, staff developed cases that varied according to assumptions about crude oil production, refinery and pipeline expansion projects, port and marine terminal capacities, and California and neighboring state fuel demand.

Increasing demand is one factor that drives gasoline prices (Figure 7-4). Potential growth for both gasoline and total transportation fuel demand (gasoline, diesel, and jet fuel) is illustrated for the High Demand Case and the Base Demand Case (Figure 7-5). Gasoline use in California will increase steadily at an average annual rate of 0.76 to 1.63 percent through 2012. From 2012 to 2020 gasoline demand declines at an average annual rate of 0.07 to 0.98 percent. This downturn in the rate of growth of gasoline demand occurs in both cases because more hybrid-electric and diesel light-duty vehicles are assumed to enter the fleet. In the Base Demand Case, greenhouse gas standards and higher fuel prices also reduce fuel demand growth.

While gasoline demand is expected to peak and then fall, total transportation fuel demand will continue to increase through 2020. Total gasoline, diesel, and jet fuel demand increases at an average annual rate of between 0.96 and 1.61 percent by 2020, growing from 553 million barrels per year in 2005 to between 638 - 702 million barrels per year.

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[280] Based on population projection series from the Department of Finance's July 2007 report, *Population Projections by Race / Ethnicity for California and Its Counties 2000–2050* (population growth rate of 26% for the 2005-2030 timeframe) and demographic data obtained from California Energy Commission Demand Analysis Office.

Figure 7-4: Projected California Gasoline Prices

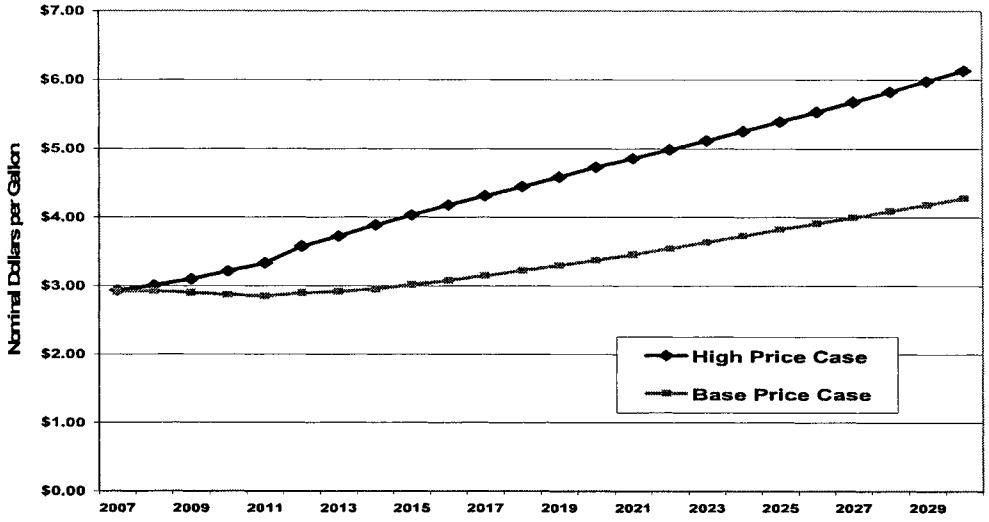
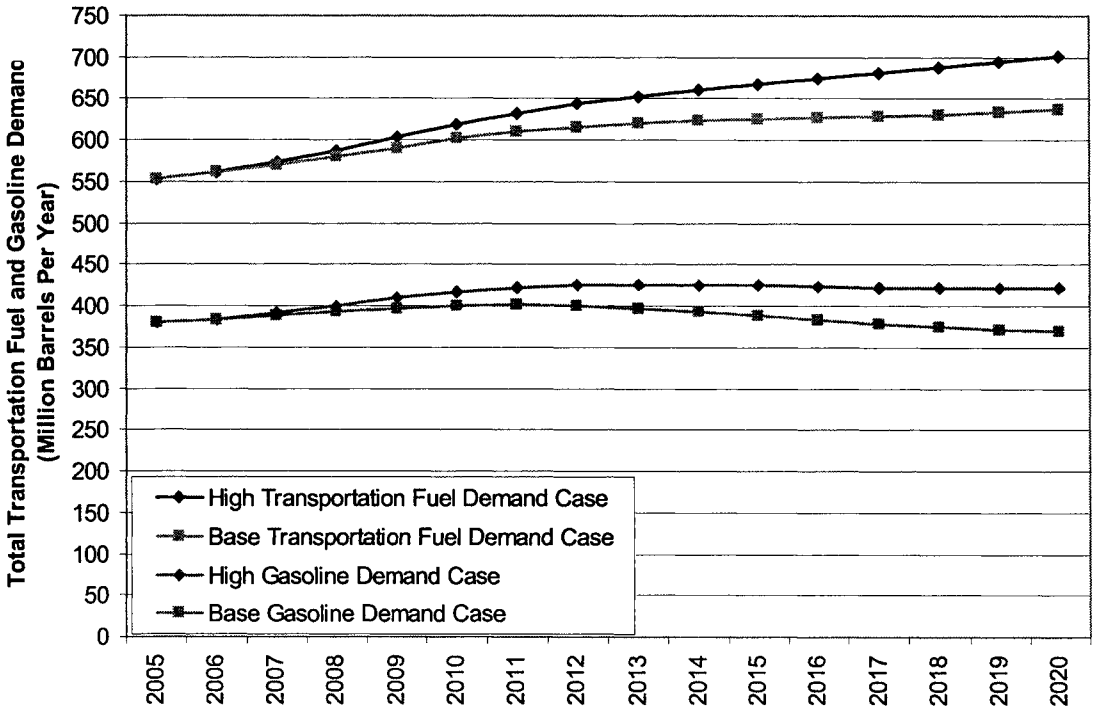


Figure 7-5: Transportation Fuel Demand



Source: California Energy Commission

Diesel fuel is expected to steadily increase its share of the transportation fuel market. Diesel consumption in freight, transit, and off-road uses is expected to continue to grow with

population and economic growth. In these sectors, diesel use will also be largely insulated from dramatic changes in vehicle fuel efficiency. At the same time, diesel is poised to make major penetrations in the light-duty vehicle market because of its marked fuel efficiency advantages compared to gasoline vehicles. Total state diesel use is projected to grow at an annual average rate of 3 percent to 3.5 percent per year through 2020.

Commercial jet fuel use in California is estimated to grow at an annual average rate of 2.9 percent to 3 percent. Future commercial jet fuel use is calculated by using forecasts of the number of passengers boarding each plane and depends on population growth and projections of revenue per passenger mile. Different paths for future jet fuel prices may cause airlines to change the quantity of jet fuel used. However, federal projections of airport capacity at Los Angeles International, San Francisco International, and San Diego International airports indicate that constraints largely limit growth so that demand levels in the High and Base Demand cases do not differ very much through 2020. In addition, fuel prices are around 25 percent of total airline expenses, so the price signals that might otherwise alter demand are dampened.

California has been called an "island" in terms of petroleum markets, but is in fact an integral part of the larger West Coast and Pacific market regions. In addition to being partially integrated with refinery operations in Washington, California supplies virtually all of Nevada's transportation fuels and over 60 percent of Arizona's, as neither of these landlocked states have any refineries (Figure 7-6). California refineries also provide 35 percent of Oregon's fuels. These refineries export petroleum products via pipelines that are linked to distribution terminals located in Reno, Las Vegas, and Phoenix. This network of interstate pipelines is owned and operated by the Kinder Morgan Pipeline Company (KMP). Demand for transportation fuels in each of these states is increasing rapidly. To meet this growing demand, pipeline exports from California to Nevada will increase at an average annual rate of 2.1 to 2.9 percent per year and exports to Arizona will increase at a rate of 2.4 to 2.6 percent per year from 2006.

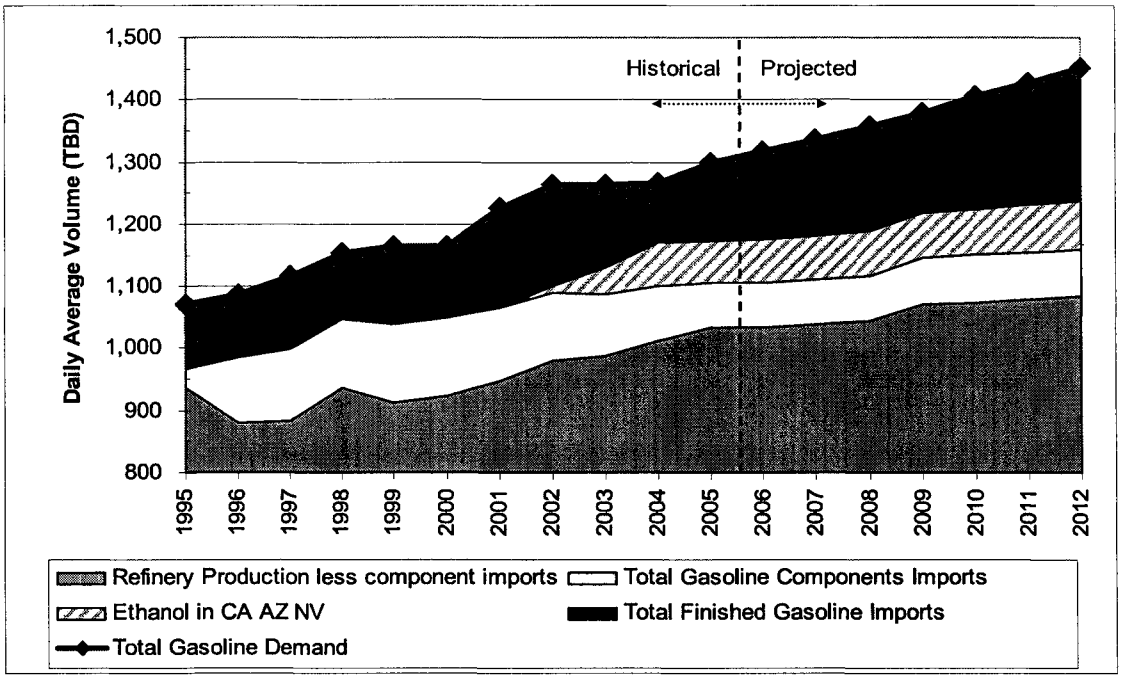
California Ethanol Demand

Currently, substantial volumes of ethanol are blended into the gasoline pool. In the near future, California ethanol demand is expected to increase primarily from changes to California's gasoline regulations and other efforts to increase the use of alternative fuels (such as the Low Carbon Fuel Standard). Energy Commission staff believes the majority of California's gasoline market will contain E-10 by 2012. As such, ethanol demand in the state under the Base Case gasoline demand scenario is expected to jump from almost 23 million barrels in 2006 to approximately 40 million barrels in 2012, a 10 percent annual average rate of growth.[281] The

[281] In the high gasoline demand and limited in-state ethanol production scenario, incremental imports of ethanol could grow to 35 million barrels per year by 2020 compared to 2006 import levels of 22 million barrels. Assuming lower gasoline demand and higher in-state ethanol production, ethanol imports could actually decline to 21 million barrels by 2020.

additional imports needed to meet this anticipated growth will depend on how many additional California ethanol production facilities are constructed over the next few years.

Figure 7-6: Regional Gasoline Supply Demand for California, Arizona and Nevada



Source: California Energy Commission; *2006 Price Spike Report*

As of July 2007, California had an ethanol production capacity of 1.8 million barrels per year. Based on additional projects already under construction, in-state ethanol production capacity is estimated to increase to at least 5.5 million barrels per year by 2009. If other projects in advanced stages of planning and financing are also pursued to completion, conventional ethanol annual production capacity could reach 16 million barrels by 2012.

The Energy Commission expects California's future transportation fuel demand to increase regardless of which price scenario and regulatory conditions are assumed. However, the magnitude of future contributions from various emerging alternative transportation fuels and technologies is unknown. Potentially, these emerging fuels, such as ethanol and biodiesel, can displace significant amounts of petroleum, which may change the mix of required infrastructure enhancements in the future. However, many of these alternative fuels, in particular renewable fuels, may also require their own additional segregated import facilities, including pipelines and storage tanks.

California must continue to meet its growing transportation fuel needs and must further consider the impacts of these needs while meeting the targets of reducing greenhouse gas emissions. To meet these needs the state must address to major areas of concern: the

constrained petroleum infrastructure and options to reduce petroleum dependency – alternative fuels, emission and vehicle standards – that trims down our carbon footprint.

California's Petroleum Infrastructure

California cannot reliably meet its increasing fuel demand without a robust petroleum infrastructure that includes refineries, storage, pipelines, distribution terminals and marine facilities. The *2005 Integrated Energy Policy Report* noted that although there had been some necessary improvements made to portions of the infrastructure, California must further expand its marine terminal capacity, marine storage and the pipelines connecting these facilities with the refineries and other pipelines if we are to meet our rising fuel demand.

Little has changed since the *2005 Integrated Energy Policy Report*; in fact, the outlook for the marine infrastructure has worsened. Staff projects that overall fuel demand will continue to grow, increasing imports through a marine infrastructure that is already congested and that exceeds infrastructure capacity expansions currently under construction or to which the industry is committed.

Whether California consumers and businesses have adequate supplies of transportation fuels over the forecast period will be determined by existing spare capacity, magnitude and timing of marine terminal expansion activity, and demand projections. Several conclusions from the *2005 Integrated Energy Policy Report* are applicable today:

- Important segments of the state's existing fuels infrastructure are already being used at or near their capacity.
- The current capacity of existing marine infrastructure, particularly in the Los Angeles and Long Beach marine terminals, could decline as a result of pressure to remove petroleum facilities from port areas and from requirements to meet seismic standards implemented by the State Lands Commission.
- Petroleum marine terminal capacity, marine storage, and gathering pipelines that connect marine terminals with refineries will have to expand to meet expected demand for fuels. Most of this expansion would occur in the Los Angeles Basin.
- Expansion of transportation fuel marine infrastructure will become more difficult in the Los Angeles Basin as available land becomes increasingly scarce and subject to competing uses and because residents, community groups, and local authorities have expressed substantial resistance to such expansion.

Effects of Competition for Existing Terminal and Storage Capacity

As transportation fuel demand and imports increase, facilities to accommodate the increased number of vessels carrying cargoes of crude oil, gasoline, diesel, and jet fuel must also expand. Without an adequate import infrastructure there will not be ample transportation fuels for the state. Marine terminals are naturally limited in their ability to operate at their theoretical

maximum capacity since it is difficult to precisely calculate a tanker's travel time and arrival (because of changing sea conditions) and unexpected delays in unloading cargo (lengthy inspections, processing delays in paperwork, and interruption of pumping operations during cargo discharge) automatically reduce the number of vessels a terminal can manage. Most marine terminals operate at 50 to 70 percent of their capacity, which is considered at or near maximum economic and safe operating levels. Having tankers wait at anchor in the harbor is impractical from both economic and safety perspectives and costly from the tanker owner's perspective.

Vessels unable to unload cargoes, despite an immediate need for the product, not only impact the tankers' owners with delays costs of $30,000 to $100,000 per day but consumers also pay a price for this congestion with increased retail costs. A 10-cent per gallon increase in gasoline, diesel, and jet fuel prices means over $6 million per day increased direct consumer expenditures on these fuels, depending on demand levels.

Congestion also leads to additional tankers at anchor in the port or nearby, which raises risk of serious accidents and even spills, and possibly increased emissions. Many harbors and waterways in California already have a significant amount of marine vessel traffic.

Over the past 15 years approximately six million barrels of storage tank capacity has been removed from Southern California. The potential loss of more existing marine terminal capacity from voluntary business decisions, involuntary forced closure due to current lease termination of or refusal by a lease holder to renew an exiting marine terminal operating lease erodes the ability to meet California's transportation fuel demand. Constrained storage capacity also limits increased imports of alternative fuels, in particular biofuels necessary to meet the state's goals for reducing petroleum use.

Challenges to Developing Additional Capacity

Efforts to expand existing or create additional petroleum infrastructure, specifically in the San Pedro Harbor, have been met with stiff resistance from some local community members, elected officials, and port representatives. Objections include concerns over increased air pollution, increased truck traffic, visual aesthetic opposition to the sight of storage tanks, perceived safety threats to nearby communities, and competition for diminishing spare land that is coveted by community members for park/recreational development and by port representatives for expansion of cargo container handling facilities.

Dredging and Maintenance Standards

Unlike facilities in the Los Angeles Basin, San Francisco Bay marine petroleum terminals face sizeable limitations caused by the relatively shallow depths of their shipping channels. The draft or depth that a vessel sits on the water, of modern very large crude carriers (VLCC) exceeds the depth of these shipping channels. This requires either more shipments by smaller tankers or transferring, called lightering, of loads from larger tankers that anchor in areas outside the constrained channels into smaller vessels that continue to the terminals. Lightering is strictly regulated by the Department of Fish and Game's Office of Spill Prevention and

Response and the United States Coast Guard and incurs extra costs, inefficiencies, time delays and risks that would be avoided by more direct access. In some cases, water depths near marine terminals are difficult to maintain at depths adequate for even smaller tankers.

Timely and reliable dredging of the Pinole Shoal sufficient to support marine shipments into the Carquinez Straits is an ongoing challenge. Environmental rules limits the time allowed when dredging activities can take place and where dredging spoils can be deposited. Most terminals in the San Francisco Bay area also require periodic maintenance dredging to offset silt deposits in nearby lanes. These logistical and permitting requirements do not prevent crude oil and transportation fuels deliveries but can lead to higher costs for producers and consumers. It is important that federal funding for Pinole Shoals dredging receive continuous high priority to ensure adequate shipping depths through the Carquinez Straits to upstream refinery marine terminals.

All California petroleum marine terminals are under a new set of regulations known as the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS), approved by the State Lands Commission in 2004. MOTEMS are a comprehensive standard for the design, construction, maintenance, inspection and repair of petroleum marine terminals. These standards primary purpose is to prevent crude oil and petroleum product spills. Since the average age of most of these marine terminals is more than 50 years, the design and configurations have not been updated to accommodate the growth in vessel size or structures. Applying the MODEMS will extend the life spans of these aging facilities and reduce their seismic, mooring and berthing vulnerabilities.

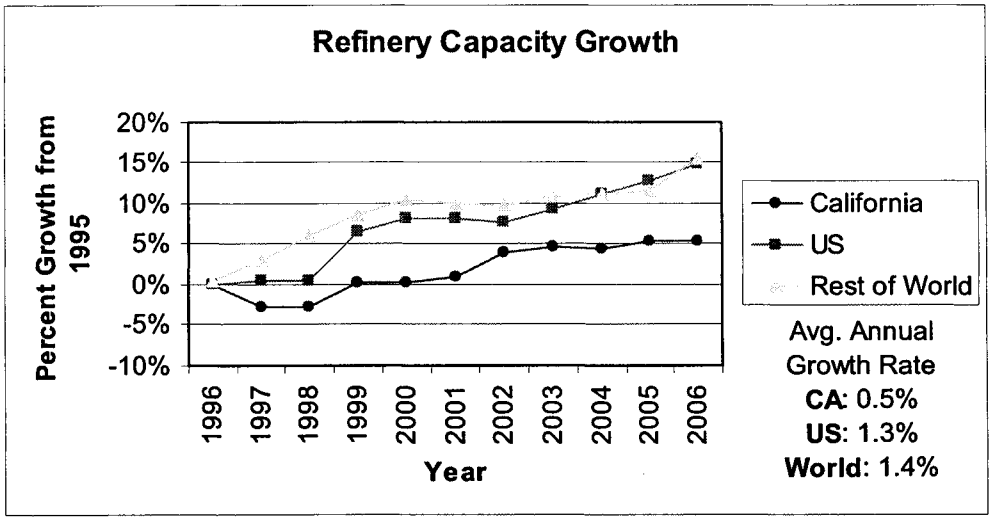
Some of the state's marine terminal network, especially in Southern California, will require substantial upgrades to meet these standards. These costly investments may cause short operational disruptions; however, some terminals in the San Francisco Bay have already performed these seismic and structural upgrades on a much larger scale. The MOTEMS regulations include compliance flexibility and an implementation schedule with flexibility dependent on annual funding limits, environmental restrictions and any other permit permitting or regulatory compliance issues. With some thought and good engineering, there should be almost no operational disruptions or fuels price impacts caused by MOTEMS compliance. It is important that Energy Commission staff continue to monitor progress toward compliance with MOTEMS as well as the actions by the ports to terminate leases to oil terminals to determine any potential impacts to the flow of crude oil and transportation fuels of these standards.

Refining and Storage Capacity

As the demand for transportation continues to grow throughout the world, refiners have responded by increasing the capacity to process crude oil. In 2005, California refineries processed 674 million barrels (1.8 million barrel per day) of crude oil; however, the state's refinery capacity is expanding at a slower rate than in the United States or the rest of the world (Figure 7-7). Based on increased future transportation fuel consumption in California and neighboring states, staff found that demand grows faster than the ability of refineries to

produce those fuels. California refinery capacity growth, known as refinery creep, is relatively low and only expected to increase at an annual average rate between 0.4 and 0.98 percent per year through 2020.

Figure 7-7: Refinery Capacity Growth for U.S., California, and the World



Source: California Energy Commission; *2006 Price Spike Report*

Even this small, expected refinery growth requires more tankers than at present to bring in refined products, congesting marine terminals, as well as requiring more marine port storage capacity. Coupled with the state's steadily declining crude oil production, even low refinery capacity growth rates will require growing levels of crude oil imports and increased crude oil storage capacity. Imports of crude oil into California are expected to rise at an annual average rate between 1.7 to 2.7 percent per year by 2020.

Additional storage tank capacity necessary to meet California's product storage requirements by 2020 ranges from 5.4 million and 13.1 million barrels and the additional crude oil storage capacity needed ranges from five to 17 million barrels.

Assuming planned storage capacity is built, crude oil import capacity in the Los Angeles Basin should be sufficient through 2015, but in the higher imports case, more capacity would be required by 2020. The Crude Oil Import Marine Facility project at Pier 400 in the Port of Los Angeles has been significantly delayed and this facility is a critical element of this assumption of adequate capacity through 2015. Further delay by the Port of Los Angeles could put at risk the oil industry's ability to import sufficient quantities of crude oil to operate their refineries.

Crude oil tankers are considerably larger than product tankers - an average crude oil tanker load is about 700,000 barrels while an average product tanker load is around 300,000 barrels. By 2020, the number of additional crude oil tanker arrivals to California ports is estimated from between 167 to 291 per year, depending on assumptions about state oil production and refinery

capacity additions. And additional product tanker arrivals per year could range from as few as 214 to as many as 519, again depending on assumptions about product demand.

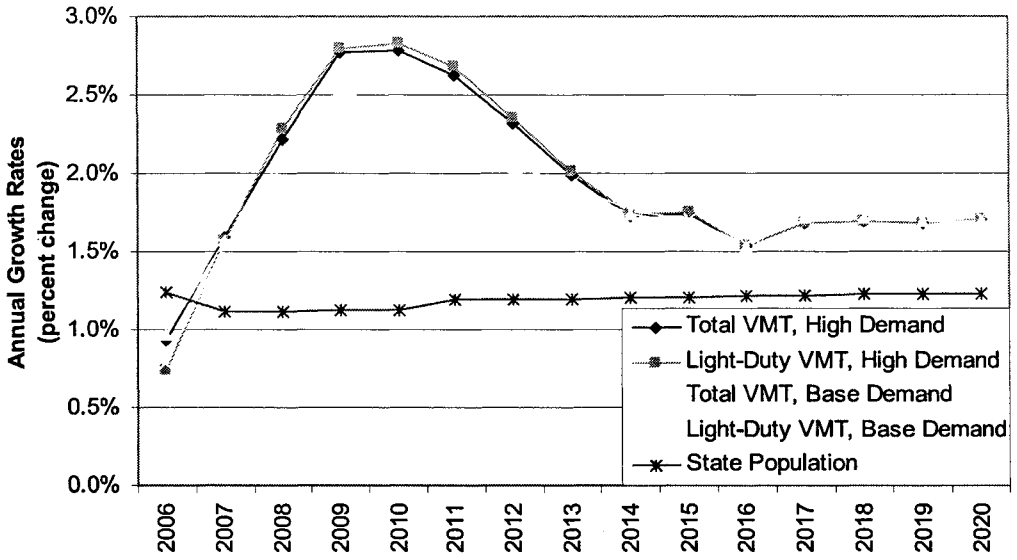
The relative contribution of criteria pollutants by various marine vessels from petroleum tanker emissions are marginally less than emissions from container ships per port visit. Overall, emissions from marine tankers in 2001 represented between 1.2 and 8.2 percent of air pollution from all sources in the Port of Los Angeles, depending on type of pollutant.

Providing Transportation Options

Californians require mobility to conduct their everyday lives and attend to their business needs. For the most part, this mobility is achieved through use of a petroleum-fueled vehicle, typically with a single occupant, and is measured as vehicle miles traveled. Figure 7-8 shows the narrow range of future travel demand expected under differing future conditions of fuel prices and fuel efficiency standards. Travel demand is essentially a fixed requirement for individual consumers of transportation goods and services in a state as physically expansive as California, where distances are large and most metropolitan areas extensive and poorly served by public transit. Reducing this public access to work, recreation, and other travel cannot be accommodated at present without disruption and economic loss. Moreover, population growth translates directly into increases in aggregate travel demand.

Consumers must have a broader set of choices to simultaneously reduce the environmental, social, and economic costs of transportation energy use while maintaining their mobility. Although conventional petroleum fuels will be the main source of transportation energy for the foreseeable future, over the next several decades California must pursue multiple complementary strategies that increase fuel efficiency, expand non-traditional fuel use, and ultimately realign consumer preferences to reduce demand for all transportation energy use as well as reduce trips and vehicle miles traveled (VMT).

Figure 7-8: A Population on the Move



Source: California Energy Commission

Government mandates, policy directives, incentives, and increased concerns over the negative environmental and economic consequences associated with global climate change are all aligned to increase the use of alternative fuels in California. The increased use of fuels with a lower carbon intensity than conventional petroleum fuels can help meet the mobility requirements of consumers while reducing the economic and environmental impacts of continued petroleum dependence. However, increased availability of alternative refueling infrastructure and changes in vehicle procurement processes needs to support a broader concept of transportation choices under AB 32.

Even though fuel efficiency and greater use of alternative fuels can contribute to lower petroleum consumption, California cannot meet its long-range goals of reducing greenhouse gas emissions without fundamental changes to the way we meet our mobility needs. Changing the patterns that cities take as they grow so that destinations are closer to people's homes and channeling urban growth so that public transit can assume a larger burden of travel demand are elements of the longer-term strategy that the state must develop if gains made in other policy areas are not to be overwhelmed by future population growth.

While California must address its petroleum infrastructure problems and act prudently to secure transportation fuels to meet the needs of our growing population, this should be viewed as a complementary strategy to allow for time for the market and consumer behavior to make the adjustment to alternative fuels and transportation choices. During this transition, California must be innovative and aggressive in finding more ways to make increased efficiency, greater renewable fuel use, and smart land use planning the most desirable consumer options.

Changing the Future

Decreasing California's reliance on petroleum fuels is critical. By 2020, at current trends, over 44 million Californians will consume more than 24 billion gallons of gasoline and diesel fuel each year. The consequences are quite clear: major investments in petroleum refinery and delivery infrastructure expansions, more dependency on foreign energy supplies, and decreased environmental and public health quality.

California's energy policy - the loading order - identifies energy efficiency, renewables and new infrastructure improvements as the state's priorities in meeting growing energy demand. These strategies also apply to transportation. Improved efficiency of transportation energy use, in large part through vehicle standards, is the most effective and sustainable strategy for reducing our demand for transportation fuels. Applying these preferred strategies to transportation focuses first on the pursuit of maximum achievable energy efficiency. Efficiency improvements can be made in vehicle energy use, individual vehicle miles traveled, and goods movement.

Corporate Average Fuel Economy (CAFE) Standards

The average, on-road fuel economy of cars and light-duty trucks in California increased from 12.6 miles per gallon (mpg) in 1970 to 20.7 mpg in 1985 as a result of federal standards. These standards have not substantively changed in 22 years. Fleet averaged, on-road fuel economy has deteriorated steadily as consumers purchased more light trucks, especially sports utility vehicles (SUVs), which meet a lower miles per gallon CAFE standard. With the implementation of small increases in CAFE requirements for light-trucks as described below, this trend began to reverse in 2004 and the combined fleet's fuel economy has gradually improved by about 2 mpg.

The goal of the original 1977 federal CAFE standards for passenger cars was to double new car fuel economy to 27.5 mpg by model year 1985. Congress did not specify a target for the improvement of light truck fuel economy. Instead, it directed that they be established administratively, at the maximum feasible level for model year 1979 and each year after. The act gave the exclusive authority for establishing fuel economy standards to the federal government. The National Highway Traffic Safety Administration (NHTSA) is responsible for establishing and amending the light-truck CAFE standards.

In April of 2003, NHTSA adopted new, "reformed" light-truck CAFE requirements, now based on size (distance between front and rear axles times average wheel track width) with larger vehicles allowed to have lower fuel economy. The reformed light-truck CAFE requirements increase this requirement to 21.0 mpg in 2005, 21.6 mpg in 2006 and 22.2 mpg starting in 2007. These values assume the same market shares by vehicle size as previous sales. Additionally, the reformed CAFE requirements apply to medium-duty passenger vehicles (rated at 8,501 to 10,000 pounds gross vehicle weight).

Because CAFE standards have been largely unchanged until the modest improvements in 2003, most technological improvements to engines and vehicles have been used to increase

performance and overcome weight gains from the larger vehicles, especially trucks and SUVs, rather than to improve fuel economy.

National experts, such as the National Research Council of the National Academy of Sciences and the American Council for an Energy Efficient Economy, have identified multiple pathways to achieve an on-road fleet average fuel economy of 30 to 45 mpg. Their analysis shows that, in most instances, increasing fuel economy creates consumer fuel savings that exceed the increased cost of the more fuel-efficient vehicle. In addition, society benefits from improvements to the environment and energy security.

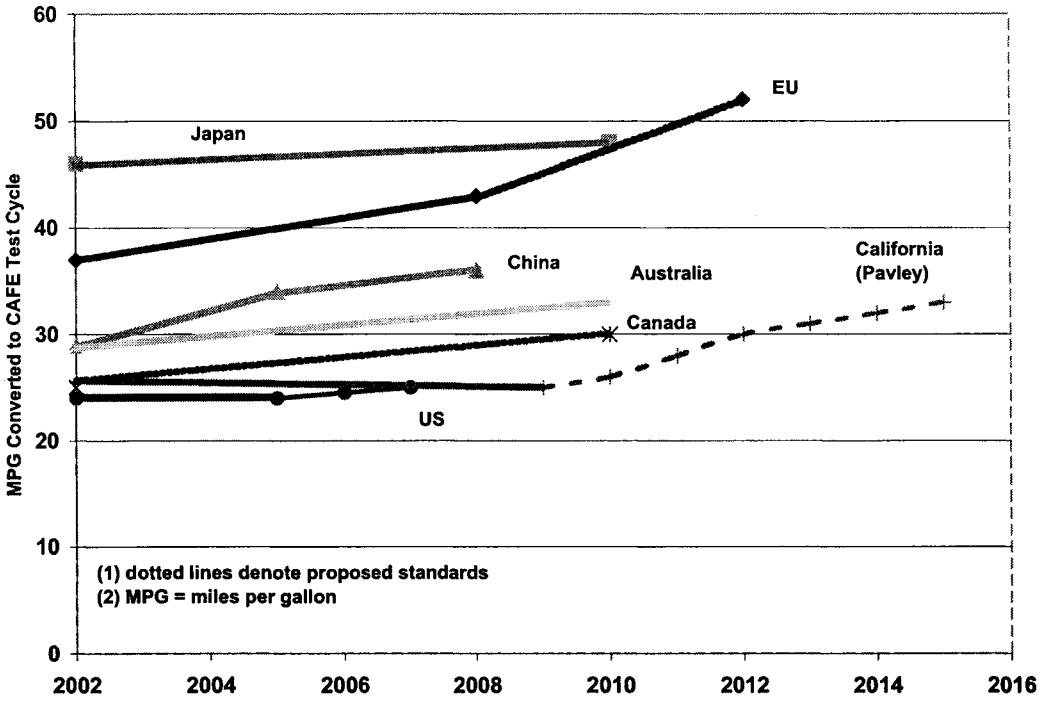
Requiring vehicle manufacturers to improve fuel economy, however, is the sole domain of the federal government. The challenge for California policy makers is to work effectively with the federal government to improve new vehicle fuel economy.

In June 2007 the United States Senate voted to raise fuel efficiency standard for cars to 35 miles per gallon in 2020. As of July 2007, no action has been taken by the House of Representatives and the fate of any legislation to modify CAFE remains uncertain. This proposed legislation is a step in the right direction because United States manufacturers individually have only recently begun to see the value of improving their vehicles' fuel economy as they lost market share to other companies. The federal government can help automobile manufacturers by requiring them to meet improved CAFE standards. By instilling "fuel economy discipline" through more demanding CAFE requirements, United States auto manufacturers will be better able to compete with international companies in the world market. A recent analysis by the University of Michigan's Transportation Research Institute has concluded that adopting size-based CAFE requirements similar to those adopted for light-trucks would improve the competitive position of U.S. automobile manufacturers and workers.[282] Additionally, CAFE improvements do not have to reduce vehicle safety or compromise performance; hybrid-electric vehicles are proof of this.

Japan, the current leader in the auto industry, has a fuel economy standard equivalent to 45 mpg. Europe has recently passed legislation to raise its fuel economy standards to more than 50 mpg by 2012 and even China and Australia have higher fuel economy than California and United States. (Figure 7-9)

Figure 7-9: Comparison of Fuel Economy of Passenger Vehicles

[282] Walter S. McManus, PhD. Director, Automotive Analysis Division, University of Michigan Transportation Research Institute, Ann Arbor, Michigan, July 2007, page 5.



Source: Pew Center on Global Climate Change, *Comparison of Passenger Vehicle Fuel Economy and Greenhouse gas Emission Standards Around the World*, December 2004

A study by Union of Concerned Scientists found that a 35 mpg fleet would create as many as 170,800 jobs in 2020 — including 22,300 in the auto industry — and save consumers nearly $25 billion on gasoline with average prices at $2.55 per gallon. The increase in fuel efficiency would also save Americans close to 2.5 million barrels of oil per day.

Since over 39 percent of California's greenhouse gas emissions come from transportation (on-road gasoline use is 27.7 percent, on-road diesel use is 5.8 percent and railroad, marine and aviation make up the remainder), it is important to address this problem at its source.

The *2003 Integrated Energy Policy Report* stated that California should work to build a coalition with other states and stakeholders to influence Congress and the U.S. Department of Transportation to once-again double the fuel economy of new passenger cars and light trucks. Three proposals now active in Congress would implement reformed CAFE requirements for both passenger cars and light-duty trucks and would require the overall United States market to improve from a 2005 base of 23.7 mpg to 32 to 35 mpg.[283] The modest improvements seen to

[283] Same as above, Table ES-2.

date, and even the more aggressive targets in pending legislation, suggest that coalition building must continue.

The recommendation to double fuel economy as called for in the *2003 Integrated Energy Policy Report* was based on results of a joint Energy Commission/Air Resources Board study of options to reduce petroleum use, as directed by AB 2076 (Chapter 936, Statutes of 2000). This recommendation was by far the most significant and cost-effective single petroleum reduction strategy resulting from this joint study, which was based upon technologies either already on the market or judged to be ready to enter the market.

Fuel Substitution Options - Alternative Fuels

Governor Schwarzenegger, in his response to the *2003 Integrated Energy Policy Report*, called upon the California Energy Commission (Energy Commission) to craft a workable long-term plan to increase the use of alternative fuels. Recent legislation, Assembly Bill 1007 (Pavley, Chapter 371, Statutes of 2005), directs the Energy Commission, in partnership with the California Air Resources Board (Air Resources Board), to develop a State Alternative Fuels Plan (Plan) to increase the use of alternative fuels, without adversely affecting air pollution, water pollution, and public health.

Assembly Bill 1007 specifically requires the State Alternative Fuels Plan to:

- Evaluate alternative fuels using a full fuel cycle analysis.
- Set goals to increase alternative fuels in 2012, 2017, 2022.
- Recommend policies, such as standards, financial incentives, research and development programs, to stimulate the development of alternative fuel supply, new vehicles and technologies, and fueling stations.

Satisfying the bill's requirements was accomplished through an open and public process, involving one-on-one meetings with key stakeholders and public workshops conducted over the past year. The Plan, developed in partnership with the Air Resources Board, has been released in draft and is scheduled for approval by both agencies during October.

The Plan recommends a combination of regulations, incentives, and market investments to achieve increased penetration of alternative and non-petroleum fuels. In addition, to accomplish a longer term vision for the year 2050, vehicle efficiency improvements, and significant reductions in vehicle miles traveled are needed. The Plan describes strategies, highlights actions, and recommends mechanisms to concurrently address multiple state policies in an integrated fashion:

- Petroleum reduction: joint recommendations by the Energy Commission and the Air Resources Board in response to Assembly Bill 2076 (Chapter 936, Statutes of 2000).[284]
- GHG reduction: Governor's Executive Order S-3-05 on Climate Change (2005), Assembly Bill 32, the Global Warming Act (2006), and Governor's Executive Order S-1-07 on the Low Carbon Fuels Standard.
- In-state biofuels production and use goals: California Bioenergy Action Plan and the Governor's Executive Order S-06-06 on Biomass.

It concludes that regulations alone cannot achieve the state's multiple policy goals; the State needs a portfolio of alternative, low-carbon fuels to meet the state's multiple goals of petroleum reduction, greenhouse gas emissions, and biofuels production. The plan recommends multiple strategies which combine private capital investment, financial incentives, and technology advancement approaches.

Achieving the state's petroleum reduction, climate change, and biofuels goals will require substantial investment in fueling infrastructure, production facilities, vehicle components, and commercial development of "second generation" alternative fuels and advanced technology vehicles.

Federal incentives, augmented by state incentives, will be needed to complement mandates, standards and regulations, and must be sustained and consistent over the 20 to 30 year period. More importantly, substantial capital investment by the private sector must be directed toward advanced technology and infrastructure.

Figure 7-10 shows the greenhouse gas and petroleum reduction performance of new light-duty vehicles on a well-to-wheels (WTW) basis for selected alternative non-petroleum fuels as a function of feedstock, compared to Phase 3 Reformulated Gasoline (RFG3). The figure clearly shows the greenhouse gas emissions are dependent on feedstock origins and production pathways.

Results of the Plan's full fuel cycle (Wells-to-Wheels) analysis demonstrates that alternative fuels can provide substantial greenhouse gas reduction benefits, when used in mid-size passenger cars and urban buses. Depending on the fuel pathway chosen, fuels such as ethanol, natural gas, liquefied propane gas (LPG), electricity, and hydrogen have decided advantages over conventional gasoline and diesel fuels.

Assembly Bill 1007 goals for each fuel were developed using a scenario approach. Each scenario has a Business-As-Usual (BAU), Moderate and Aggressive case. The cases differ by the assumptions made about technology maturity, vehicle and infrastructure availability, fuel supply and fuel type. Alternative fuel and vehicle goals were not simply based on desired reductions in petroleum use and emissions, but were derived from assessments about the potential market expansion of each alternative fuel, informed by substantial research and

discussions with the alternative fuel industries. Fuel use goals were determined by several approaches appropriate to the data available for the Assembly Bill 1007 candidate fuel or an appropriate analog for the fuel and vehicle technology combination.

Figure 7-10: Vehicle GHG and Petroleum Reduction Performance of Alternative Fuels for Light-duty Vehicles as a Function of Feedstock

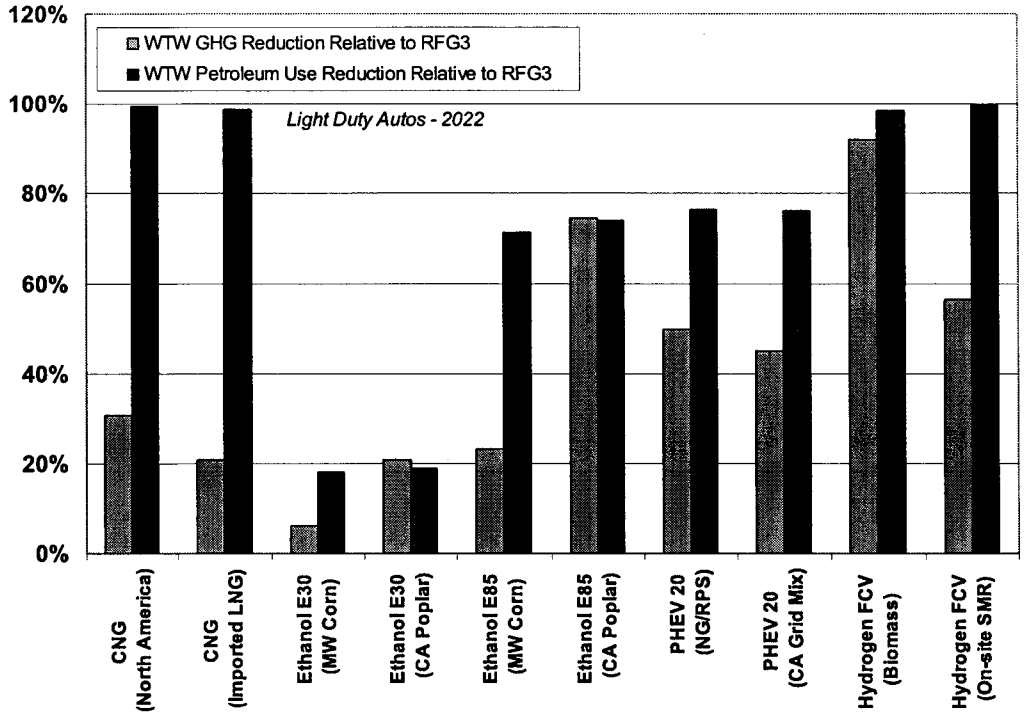


Figure 7-11. Alternative Fuels Use Goals (mm gge)

Alternative Fuels Case	Milestone Year 2012	2017	2022
Business as Usual	1,434	1,713	2,106
AB 1007 Goals (Moderate Case)	2,360	3,565	5,220
Aggressive	2,943	6,772	11,298

Biofuels, produced from the state's agricultural, forestry, and urban waste residues, should be pursued in the short term, because of their petroleum reduction, waste reduction, and climate change benefits. Over the longer-term, advanced biofuels, hydrogen, and plug-in hybrid vehicles are expected to play a role in meeting California's Low Carbon Fuel Standard.

Certain biofuels can provide large greenhouse gas reductions (up to 75 percent compared to gasoline) because carbon dioxide emissions are recycled through plant photosynthesis. Changes in agricultural land can have a dominant impact on biofuels pathways, however, and the potential land conversion effects need to be better quantified.

Lastly, the Plan recommends a four-part strategy to achieve the state's petroleum reduction, biofuels and greenhouse gas reduction goals:

(1) promote alternative fuel blends with gasoline in the near term;

(2) maximize alternative fuels in early adopter market niches, such as heavy duty, fleets, off-road, and ports;

(3) optimize the use of alternative fuels in existing internal combustion engines in the near term, while advancing new vehicle technologies, such as electric drive and hydrogen fuel cells, in the mid-to-long term; and

(4) reduce Vehicle Miles Traveled and Vehicle Hours Traveled through a combination of travel demand reduction and sound land use planning measures.

Recommendations and Action Steps

To continue to meet California's growing transportation fuels needs while also complying with the directives of AB32, the Energy Commission makes the following recommendations:

- Energy Commission representatives should participate whenever possible in transportation-related workshops and public forums to provide information and stress the role of transportation energy infrastructure in the health of the California economy.
- The Energy Commission should involve local and other state agencies to a greater degree during the IEPR process in efforts to maintain and expand needed transportation energy infrastructure, including mitigating the impacts of lease denials.
- The Energy Commission should stress to local and state authorities the connection between infrastructure expansion requirements and measures that reduce demand for petroleum fuels, as shown in this report by the impact of the greenhouse gas regulations.
- To help ensure that independent traders are not unfairly denied access to the California fuels market, the Energy Commission should propose an arbitration mechanism for the state, backed by decision-making authority, to resolve market access issues.
- The Energy Commission should propose a new law that allows state appeals in the petroleum marine infrastructure lease renewal process at the Ports of Los Angeles and Long Beach.

- The Energy Commission should monitor the impact of the State Lands Commission Marine Oil Terminal Engineering and Maintenance Standards, especially on clean fuels marine terminals in the Ports of Los Angeles and Long Beach.
- The Energy Commission should press for a firm federal funding mechanism to maintain an adequate depth for tanker traffic in the Pinole Shoal in San Francisco Bay.